Number of events and the upstream veto wall

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Short report
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Outline

- Introduction
- Program
- Plots
- Problem - Answer
- Upstream Veto Counters
- Conclusions
- Outlook

Introduction

- There is a discrepancy between the predicted number of events and the observed number of events

- The distribution of events over emulsion modules does not match the prediction
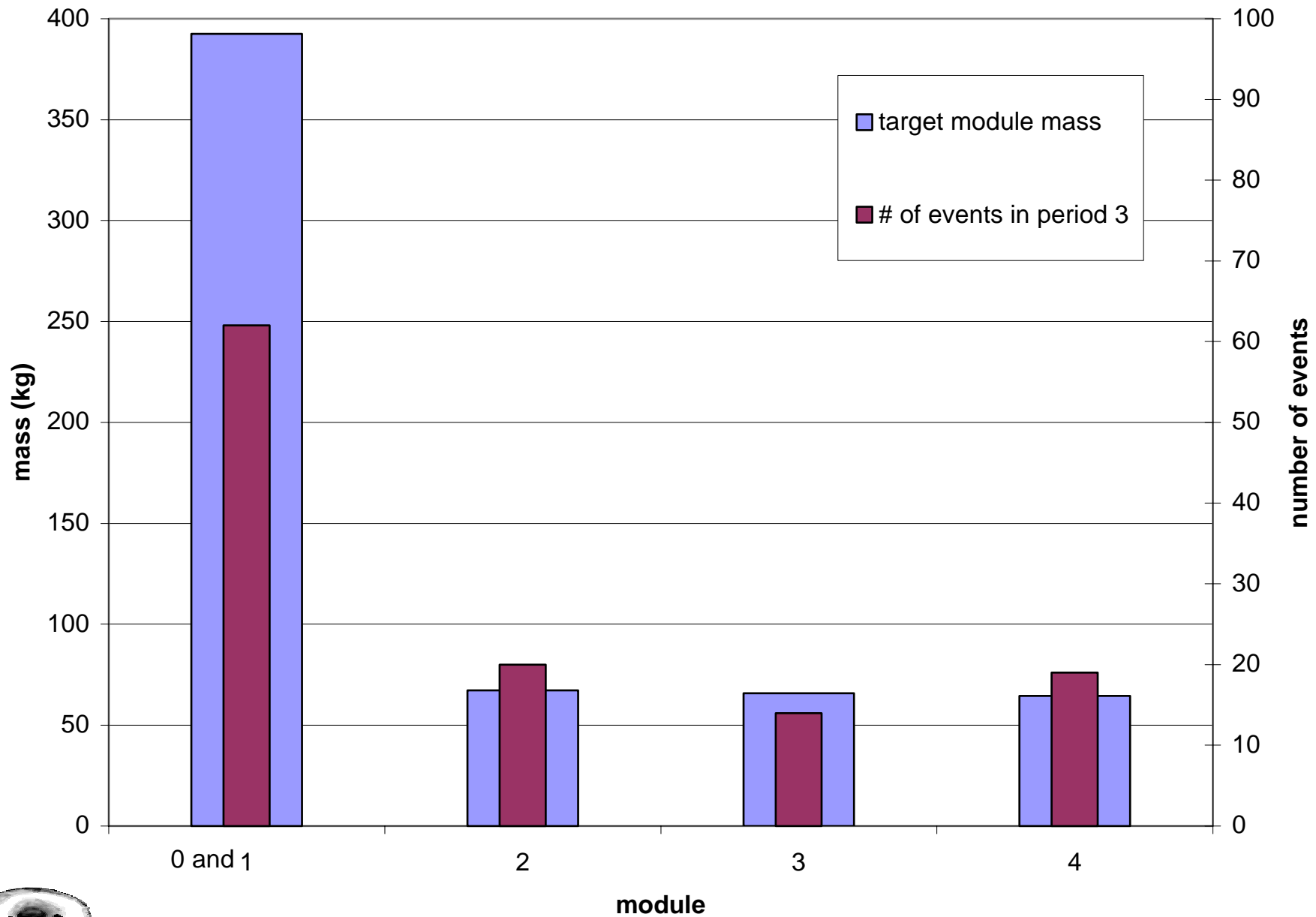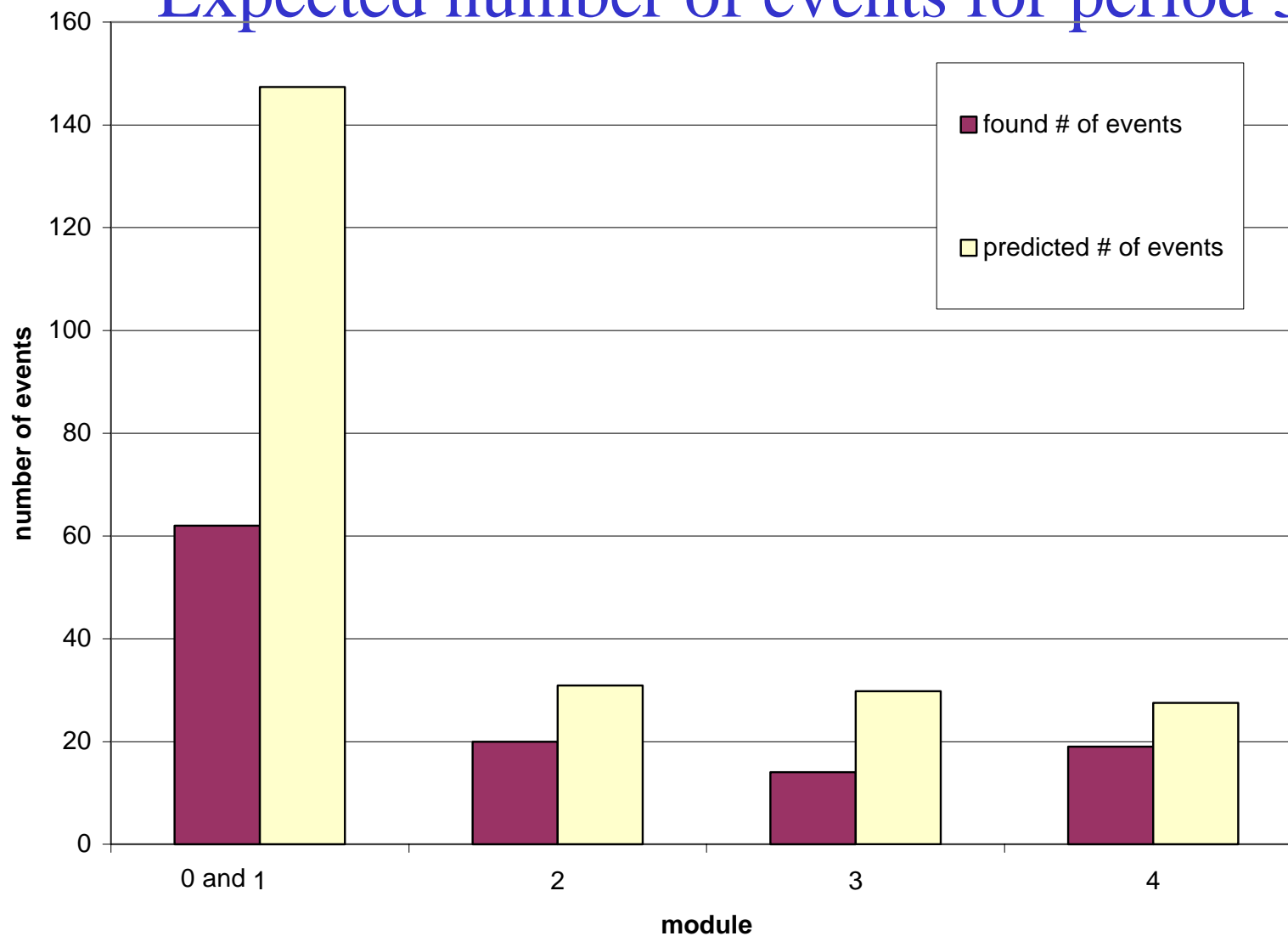
Program

- Generate 6000 events in periods 1-4 in all five modules
  - NC, prompt and nonprompt ν_μ CC
- process with my muon finding routines for nustrip files
- include efficiencies for
  - trigger
  - stripping
  - event selection
- compare to data
  - example: period 3

Period 3 target weight vs. found # of events

Expected number of events for period 3

- the predicted number includes NC,
  ν_μ CC prompt and nonprompt events
- efficiencies are included

Problem:

- The expected number of events is too large by 50%
- The expected number of events in module 0 is too large by 300%
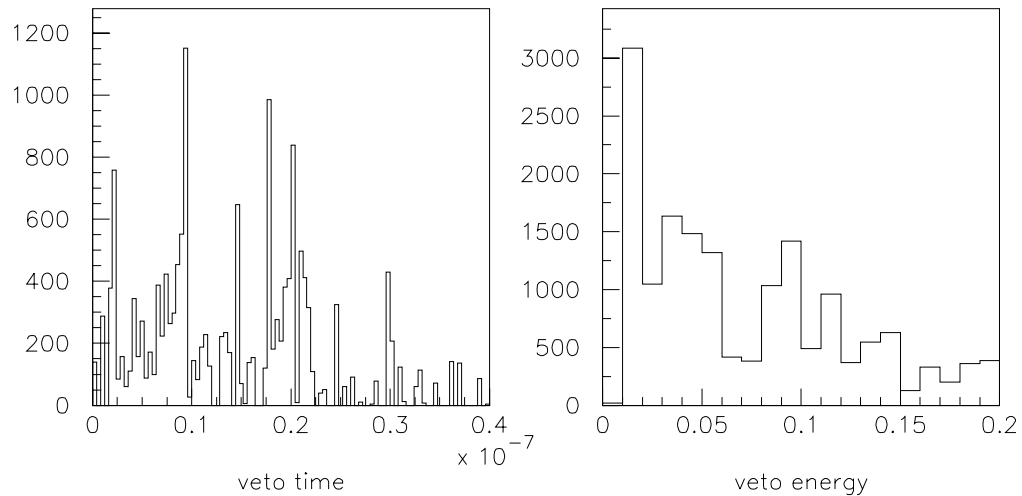- But we included all efficiencies!(?)

Answer:

- We did not include the veto counters upstream of the emulsion
  - veto lead (mod 0) events with particles going backwards from the vertex
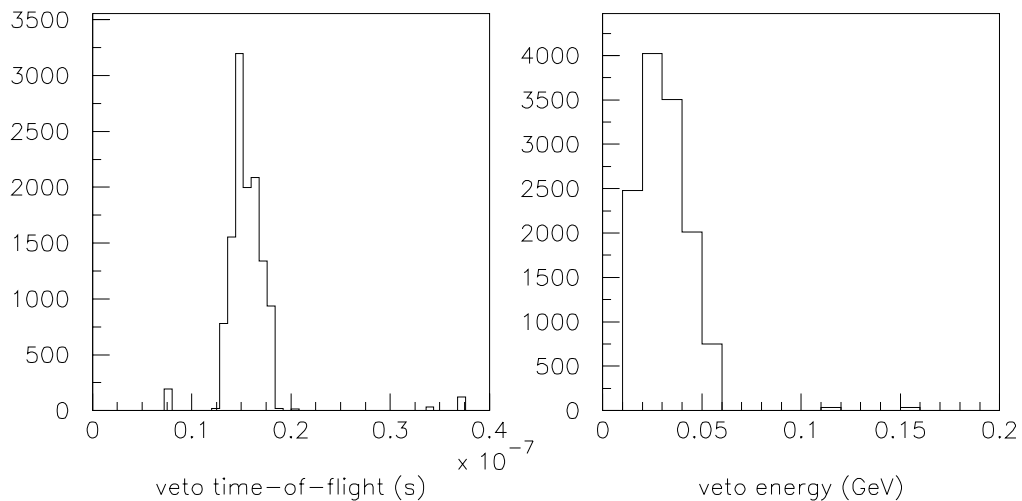 - veto events with particles bent backwards in ROSIE

TOF and energy of particles hitting the upstream veto wall (MC)

ν_μ CC interactions in module 0

ν_μ CC interactions in module 4

Upstream veto counters

- Simply including hits in the upstream veto wall will:
  - Remove 60% of the mod 0 interactions
    - slow protons from the lead move upstream to the veto counters
  - Remove 40% of the interactions in emulsion modules
    - electrons, positrons, and protons are bent by the analysis magnet and travel along the side of the target stand upstream to the veto counters
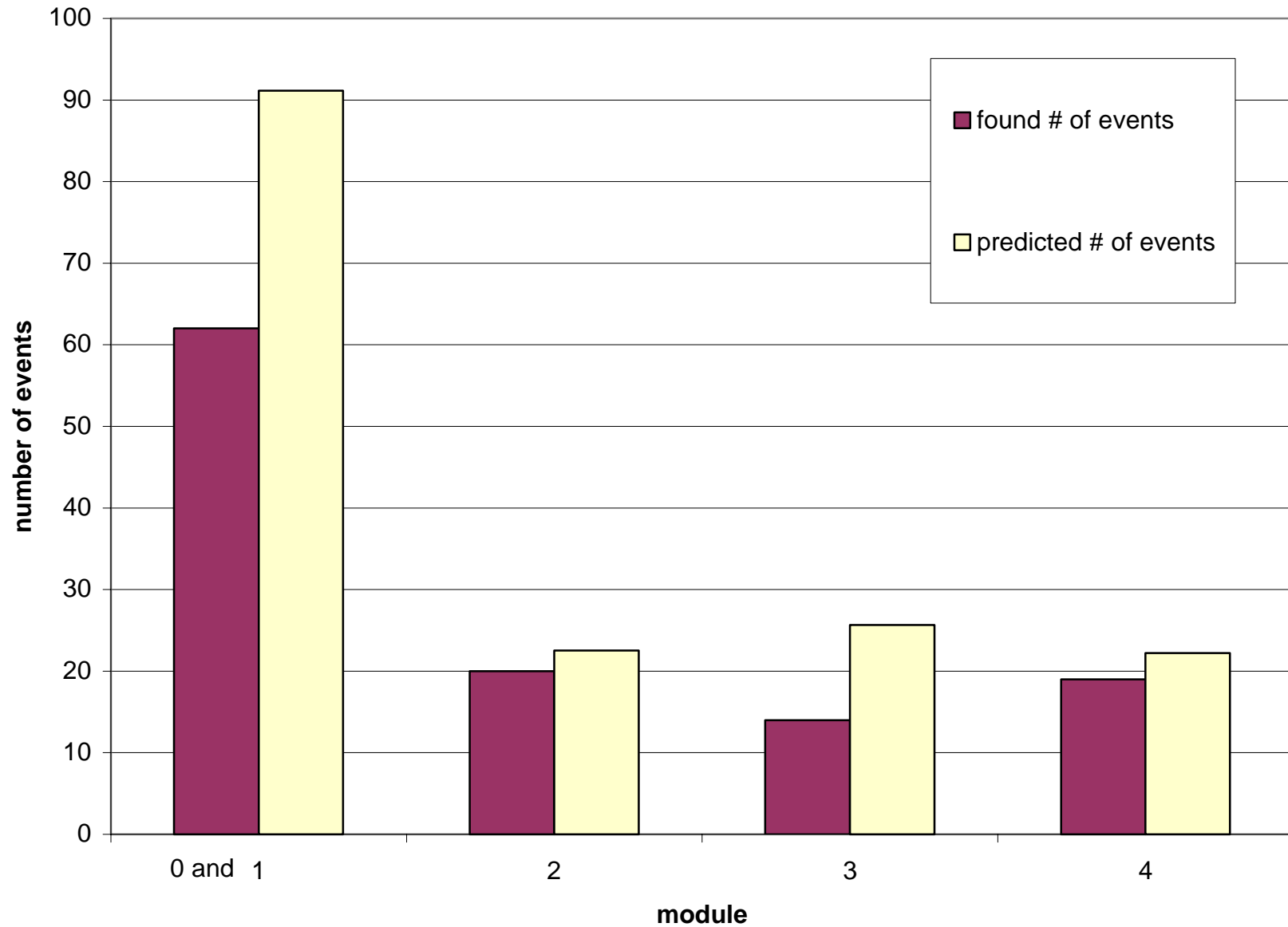- MC has no target stand material besides lead shielding

Treatment of veto counter hits

- Ignoring them produces too many module 0 events

- Including them reduces the trigger efficiency to 60%
  - low-momentum particles travelling great distances

- Solution:
  - generate a veto hit if the particle momentum is >0.1GeV

Corrected number of events for period 3

Conclusions

- Including the upstream veto counters will reduce the trigger efficiency for module 0 interactions

    - hundred MeV protons striking the counters

- GEANT has many particles hitting the veto wall that really shouldn't produce a hit

- Introducing a cut of 100MeV on particle momentum gives the correct trigger efficiencies from module to module

Outlook

- I will send my routines to Bruce
- We might need a better plan to implement veto counters
- The overall normalization (total # of events) is not correct yet
  - but already within 20%